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PATENT SPECIFICATION

247,231

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COMPLETE SPECIFICATION.

Improvements relating to Irradiation Apparatus, for Treating Fluids with Ultra-violet Rays.

We, QUARZLAMPEN-GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG, of 1, Frankfurter Landstrasse, Hanau, Germany, a corporation organised under the laws of the German State, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to improved means for subjecting to the action of ultra-violet rays, substances which may be liquids, or gases, and which are enclosed in or flow through any kind of container or pipe.

It is an object of the invention to provide an irradiating quartz apparatus which is particularly suited for the purpose indicated and is of the kind adapted to be inserted in or form the closure of an aperture provided in the wall, cover or bottom of the respective container.

According to the present invention a closure member is provided for an opening in the vessel containing the liquid or gaseous substances, the closure member consisting of a funnel-shaped frame tapering away from the vessel. A quartz panel is mounted upon the outer and smaller part of the frame and a supporting arm is applied to the outside of the frame, the arm holding the quartz lamp close up to the quartz panel. The irradiating means can be fitted with an ordinary quartz burner and is adapted to permit the irradiation of large quantities of liquids, gases or vapours in a very short time. According to the size of the container, one or several such apparatus may be provided, each being designed to receive a normal quartz burner, the rays of which are introduced into the container with the least possible loss. The burner is secured, together with a reflector which closely surrounds it, in a support in such manner as to be readily tilted. The outer end of the tapered or funnel-shaped frame is closed by the quartz disc or panel directly adjoining the burner tube, so that the rays emitted from this tube can pass through the frame within an angle of about 90°.

In the accompanying drawings an apparatus embodying the invention is illustrated diagrammatically by way of example.

In the accompanying drawings:—

Fig. 1 is a vertical cross-section, and

Fig. 2 is a plan view, partly in horizontal section, of apparatus adapted to be mounted on the side wall of a container.

Fig. 3 is a diagram showing the way in which the rays are reflected through the quartz panel.

Fig. 4 is a vertical cross-section of a frame of different form, while

Fig. 5 is a similar view of a modification.

Referring first to Figs. 1 to 3 of the accompanying drawings, *a* is the funnel-shaped frame and *b* is part of the side wall of the container in which is contained or through which flows the substance which is to be exposed to the action of the ultra-violet rays. The frame is mounted on this wall so as to surround an aperture provided in the wall, being secured thereto by means such as a flange and screw-threaded bolts or the like (not shown). The smaller opening of the funnel-shaped frame *a* is closed by a quartz panel *c* which may be raw or ground, and the thickness of the panel is such that it is capable of withstanding the pressure prevailing within the container. The width of the quartz panel *c* in horizontal direction need only

[*Price* 1/-]

Price 4s 6d

be such that including the width of the frame in which the panel is inserted, it corresponds to the space available between the pole vessels of a normal quartz burner *d*. The horizontal width of the quartz panel is thus equal or somewhat inferior to the length of the arc.

As shown in the drawings the quartz panel *c* closely adjoins the burner tube extending parallel with it, being spaced therefrom about 1 cm. or less, so that with the horizontal width of the quartz panel mounting to a few centimeters, the directly emitted rays can be introduced into the interior of the container within an angle of about 90° (Fig. 3), within which no total reflexion will occur on the surface of the quartz panel.

In the drawing *e* is the curved arm secured to the frame *a* and carrying the means for tilting the quartz burner, these means consisting of a spindle *f* extending across the arm *e* and provided with a hand wheel *m* at its outer end, while to the inner end of the spindle is secured the reflector *n*, on the inner wall of which are mounted several reflecting members *g* made of porcelain or quartz and provided with a reflecting coating of some suitable kind such as ceramic glaze, these members having the form of long strips extending parallel with the quartz tube *d* and being arranged substantially in a semi-circle or parabola surrounding this tube. The reflecting members *g* are separated by longitudinal intermediate spaces or notches serving for cooling them, the width of these spaces or notches being such that about 75% of the total emission of rays is introduced into the interior of the container, the balance of 25% being lost in the intermediate spaces or notches. The surfaces of the reflecting members *g* are partly shown in Fig. 1 as being plane, but some or all of them may instead be concave or convex, as shown for instance at *h* and *i* in Fig 5, and if desired, they may instead be corrugated. In this manner the rays are caused to intersect within the container, so that parts of the container receive a particularly vigorous irradiation and the substances passing through them are subjected to an increased action of the ultra-violet rays. The reflecting elements are preferably formed of a rhomboid or diamond-shaped cross-section (Figs. 1 and 5) in order to retain the greatest possible reflecting surface while making the cooling spaces or notches as wide as possible.

It is possible to obtain a larger angle of radiation than 90° for the directly emitted rays by replacing the plane quartz panel *c* shown in Fig. 1 by a curved quartz panel c^1 as shown in Fig. 4. In this case total reflexion is excluded at all points of the panel inasmuch as the angle of incidence of the rays always remains below X°.

By combining several such irradiating devices with a single container or apparatus, the effective quantity of light can be increased as desired and if necessary, as many apertures and irradiating lamps can be arranged on the container, as can be accommodated without endangering the strength of the walls.

The frame *a* preferably consists of the same material as the wall of the container, i.e. of clay, porcelain, hard rubber, metal or the like.

If the irradiating device is to be mounted on horizontal walls, such as the cover or bottom of a container, the distance between the quartz tube and the quartz panel should be somewhat increased in order to allow the quartz tube to be tilted for ignition.

If the substances to be exposed to the action of the rays are particularly sensitive, a single quartz panel will not suffice as a closure, inasmuch as it might be heated to an unduly high temperature by radiation from the incandescent quartz tube. In order to provide for such cases it is preferred to replace the quartz panel *c* shown in Figs. 1 and 4 by a double-walled quartz container c^2, as shown in Fig. 5, and which is provided with means such as nipples *p* for the circulation of a cooling means such as air or water. In the case where also the shortest rays passing through the quartz are to be utilized, it is preferred to cool with air. Cooling water may however be used tinted with methyl violet, in order to prevent ozone generating rays of shortest wave length being screened. By adding other dyestuffs the composition of the bundle of rays may be varied as desired. The inner panel of the double-walled container c^2 may also consist of glass made under the trade mark "Uviol", if no importance is attached to a perfect utilization of all ultra-violet rays.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Means for subjecting substances in liquid or gaseous phase to the action of ultra-violet rays, comprising a closure member for an opening in the vessel containing the liquid or gaseous substance, the closure member consisting of a funnel-shaped frame tapering away from the vessel, a quartz panel mounted upon the outer and smaller part of the frame, and

a supporting arm applied to the outside of the frame, which arm holds the quartz lamp close up to the quartz panel, substantially as hereinbefore described.

2. Means as specified in Claim 1 in which the distance of the quartz lamp from the frame and also the opening in the frame is such that the directly emitted rays pass through the frame within an angle of about 90°, substantially as described.

3. Means as specified in Claims 1 and 2, in which the quartz panel closing in the frame is curved or arched towards the side of the vessel for the purpose and substantially as described.

4. Means as specified in any of the preceding claims in which the quartz lamp is surrounded by a reflector, the opening in which corresponds in dimension to the opening in the funnel-shaped frame which is closed in by the quartz panel, and in which the greater part of the emitted rays pass through the quartz panel into the interior of the funnel-shaped frame, substantially as hereinbefore described.

5. Means as specified in Claim 4 in which the quartz lamp is carried by the reflector which is mounted upon a pin rotatably supported upon the supporting arm applied to the frame, the pin being provided at its outer end with a hand wheel, for the purpose and substantially as hereinbefore described.

6. Means as specified in Claim 4 or in Claim 5 in which the reflector consists of separate strips of ceramically glazed porcelain or quartz which are arranged with interstitial spaces and are made shorter than the illuminating tube, the strips being mounted a short distance from the illuminating tube, substantially as described.

7. Means as specified in Claim 6 in which the reflector elements are provided of a rhomboid or diamond shaped cross-section, in order to reduce the reflecting surface as little as possible, substantially as described.

8. Means as specified in Claim 6 or in Claim 7 in which the surfaces of the reflecting quartz or porcelain strips are arched or corrugated, substantially as described.

9. Means as specified in any of the preceding claims in which the frame aperture contains two quartz panels and in which the space between is provided with feeding and discharging pipes for cooling or light filter media, substantially as described.

10. An irradiating apparatus constructed substantially as hereinbefore described with reference to the accompanying drawing.

Dated this 8th day of February, 1926.

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Agents for the Applicants.

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Fig. 1.

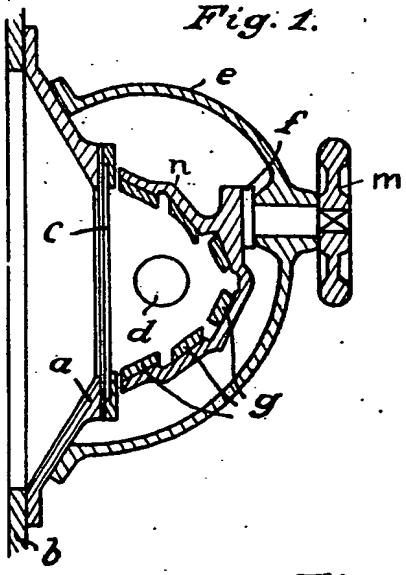


Fig. 5.

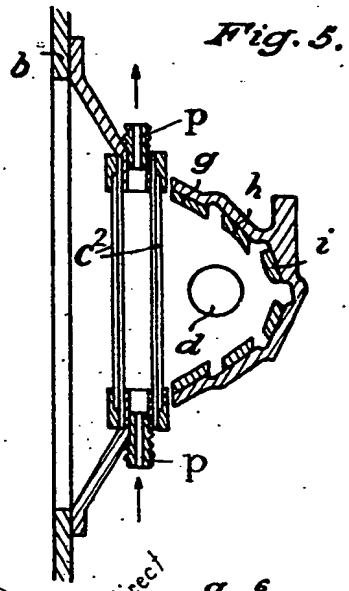
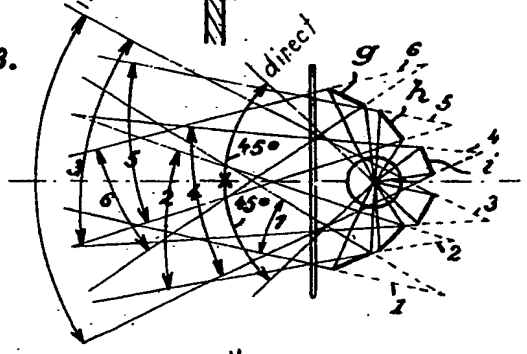


Fig. 3.



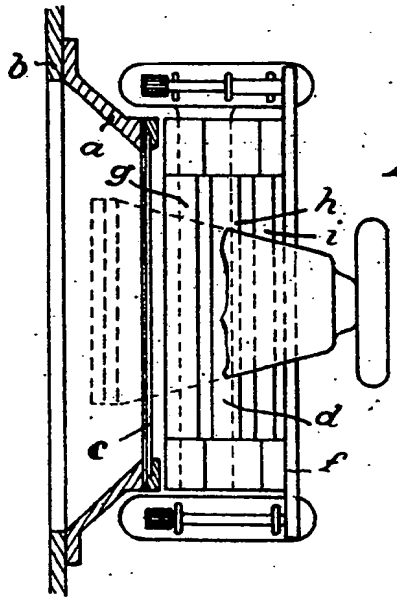
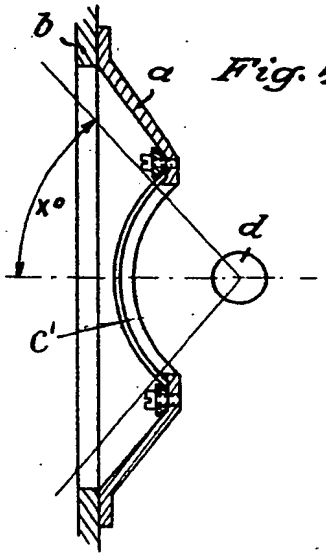


Fig. 2.

Fig. 4.



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